

Claim Objections

Claims 1, 2, 4, 5, 9, and 12 have been objected to for informalities. Applicants have incorporated most of the Examiner's suggestions (for items A through I). None of these claim amendments narrows the scope of the claims. Applicants have not incorporated the Examiner's suggestion for J because Applicants believe that it adds an ambiguity to the claim that is not present as the claim now stands. If the Examiner's suggestion of "a calcined kneaded product" is adopted, it is unknown if calcining takes place before, during, or after kneading. Thus, Applicants have left this part of the claim unamended. Withdrawal of the objections is respectfully requested.

Rejections under 35 USC §112, second paragraph

✓ Claims 6 and 9 have been rejected under 35 USC §112, second paragraph as being indefinite. The Examiner asserts that the phrase "the hydrogenation active metal components" in claim 6 lacks antecedent basis. Applicants have amended "the hydrogenation active metal components" to "the hydrogenation active metal component". It is believed that with this amendment that the rejection has been obviated. This is a non-narrowing claim amendment.

Regarding claim 9, the Examiner asserts that the phrase, "the effective amount of metal deposition" lacks antecedent basis.

Claim 9 has been amended to recite "an effective amount of metal deposition". This is a non-narrowing claim amendment. It is believed that with this amendment that the rejection has been obviated. Withdrawal of the rejections is respectfully requested.

Rejections under 35 USC §103

Claims 1-11 have been rejected under 35 USC §103 as being unpatentable over Simpson '265 (US Patent No. 4,879,265).

Claims 13 and 14 have been rejected under 35 USC §103 as being unpatentable over Simpson '265 in view of Asaoka '059 (US Patent No. 4,562,059). These rejections are traversed for the following reasons.

Present Invention

The present invention discloses a hydrotreating catalyst comprising a hydrogenation active metal component supported on a refractory porous carrier, wherein a median pore diameter determined by the nitrogen adsorption method that is 8 to 20 nm. The pore volume is determined by the nitrogen adsorption method to give a value of 0.56 - 1.0 cm³/g. The pore volume of pores having a pore diameter of 50 nm or larger is determined by the mercury intrusion porosimetry method and gives a value of 0.32 - 1.1 cm³/g.

Disclosure of Simpson '265

Simpson '265 discloses a hydrocarbon hydroprocessing catalyst containing a Group VIB metal and a phosphorus component on a porous refractory oxide is prepared by impregnating support particles with a solution containing (1) phosphorus, and (2) citric acid in a mole ratio to Group VIB metal components of less than 1 to 1, followed by drying and calcining. The catalyst is useful for promoting a number of hydrocarbon hydroprocessing reactions, particularly those involving hydrogenative desulfurization, demetallization and most particularly, denitrogenation.

Disclosure of Asaoka '059

Asaoka '059 discloses a method of preparing alumina, including a first stage in which an alumina hydrogel is formed from seed aluminum hydroxide, and a second stage in which the alumina hydrogel is processed for conversion into alumina. The first stage comprises the steps of: (a) providing an aqueous slurry containing seed aluminum hydroxide and (b) mixing a pH controlling agent with the aqueous slurry to adjust the pH of the aqueous slurry to a value less than 5 or more than 11 and to dissolve fine crystallites of aluminum hydroxide contained in the aqueous slurry, the pH controlling agent being substantially free of ions which can form a precipitate during the first step, and then (c) then mixing an alumina compound with the aqueous slurry to adjust the pH of the aqueous slurry to a value in the range of from 6 to 11. To cause the seed aluminum hydroxide to grow, steps (b) and (c) are repeated in a sequence more than once so that the seed aluminum hydroxide is

caused to grow into the alumina hydrogel.

Removal of Simpson '265 and Asaoka '059

The Examiner asserts that Simpson '265 discloses a hydroprocessing catalyst having a mode pore diameter rather than a bimodal pore diameter (column 8, lines 62-64). Simpson '265 discloses that "a preferred hydroprocessing catalyst is prepared from supports such as those disclosed herein in Table A so as to have a narrow pore size distribution wherein at least about 75 percent, preferably at least about 80 percent, and most preferably at least about 85 percent of the total pore volume is in pores of diameter from about 50 to about 130 angstroms. (see column 8, line 65- column 9, line 3).

Simpson '265 continues, "The final catalyst preferably has less than about 0.05 cc/grams or less than about 10 percent of the total pore volume in pores of diameter greater than about 110 angstroms. [11 nm]" (see column 9, lines 9-13). From this description, it is noted that a narrower pore volume distribution is suitable in Simpson '265 than is present in the instant invention.

The hydrotreating catalyst in claim 1 has a pore volume determined by the nitrogen adsorption method which is in the range of 0.56 - 1.0 cm³/g and the pore volume of pores having a pore diameter of 50 nm or larger as determined by the mercury intrusion

porosimetry method is $0.32 - 1.1 \text{ cm}^3/\text{g}$. This means that at least $24\% (=0.32/(1.0+0.32))$ of the total pore volume corresponds to pore volume having pore diameter of 50 nm or larger. Accordingly, one of ordinary skill in the art would readily surmise that the ~~hydrorefining catalyst in claim 1 is completely different from the preferred catalyst disclosed in Simpson '265.~~

With regard to claim 12, although Simpson '265 is silent about the values of pore volume of a starting power and a mean particle diameter, it is disclosed that the pore volume of the supports is 0.61, 0.63 and 0.58 in table A (see column 7). Simpson '265 also discloses that the total pore volume of the support is most preferably about 0.30 to about 0.9 cc/grams (see column 6, lines 41-46).

In contrast, the method in claim 12 comprises kneading a porous starting material having a pore volume of $0.75 \text{ cm}^3/\text{g}$ or greater. As can be seen in Comparative Example 1 of the instant invention, when powder with a pore volume of $0.70 \text{ cm}^3/\text{g}$ is used, the demetallizing activity of the prepared catalyst is low in comparison with that of the catalyst prepared in Example 1 in which powder with pore volume $1.01 \text{ cm}^3/\text{g}$ is used. From this data, one of ordinary skill in the art would readily see that the instant invention provides unexpected advantages over that disclosed in Simpson '265. The rejections of claims 1-11 over Simpson '265 and claims 12-14 over Simpson '265 in view of Asaoka '059 are

inapposite. Withdrawal of the rejections is warranted and respectfully requested.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such that a passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

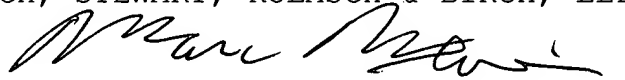
If any questions remain regarding the above matters, please contact Applicant's representative, Marc S. Weiner, in the Washington metropolitan area at the phone number listed below.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment: Version with Markings to Show Changes Made

VERSION WITH MARKINGS TO SHOW CHANGES MADE

The claims have been amended as follows.

1. (Amended) A hydrorefining catalyst comprising a hydrogenation active metal component supported on a refractory porous carrier, wherein a median pore diameter determined by the nitrogen adsorption method is 8 to 20 nm, a pore volume determined by the nitrogen adsorption method is 0.56 - 1.0 cm³/g, and a pore volume of pores having a pore diameter of 50 nm or larger determined by the mercury intrusion porosimetry method is 0.32 - 1.1 cm³/g.

2. (Amended) A hydrorefining catalyst according to claim 1, wherein the pore volume determined by the mercury intrusion porosimetry method is 0.87 cm³/g or greater.

4. (Amended) A hydrorefining catalyst according to claim 1, wherein a pore volume of pores with a pore diameter of not less than 1,000 nm measured by the mercury intrusion porosimetry method is not more than 0.2 cm³/g.

5. (Amended) A hydrorefining catalyst according to claim 1, wherein bulk density is 0.52 [cm³/g] g/cm³ or less.

6. (Amended) A hydrotreating catalyst according to Claim 1, wherein the catalyst comprises 2 to 6 wt% molybdenum and 0.5 to 2 wt% nickel or cobalt as the hydrogenation active metal component [components].

9. (Amended) A hydrotreating catalyst according to claim 1, wherein [the] an effective amount of metal deposition is 70 g or more per 100 g of fresh catalyst.

12. (Amended) A method of producing a hydrotreating catalyst comprising a hydrogenation active metal, comprising the steps of: kneading a porous starting powder whose main component is γ -alumina and which has a pore volume of $0.75 \text{ cm}^3/\text{g}$ or [g/or] greater and [an] a mean particle diameter of 10 to 200 μm to prepare a kneaded product;

molding and calcining said kneaded product; and supporting the active metal component on the kneaded product or on the kneaded product after calcining.